An Open Specification for Space Project Mission Operations Control Architectures

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Abstract

An "open specification" for Space Project Mission Operations Control Architectures (SuperMOCA) is under development in the Spacecraft Control Working Group (SCWG) of the American Institute for Aeronautics and Astronautics (AIAA). SuperMOCA has built on the early developments on Space Station Freedom where a major effort was launched to establish a comprehensive information management architecture for operation of the spacecraft. The architecture identifies five basic elements incorporated in the design of all space mission operations systems. First, the ***Data Architecture*** provides for the organization and management of the abstract objects that represent the real assets and resources of the spacecraft, Second, the ***System Management Architecture*** provides for the organization and management of the operations environment of the spacecraft. Third, the ***Control Interface*** provides a user friendly mechanism to operate and manage the spacecraft. Fourth, the ***Decision Support Engine*** operates the spacecraft and processes commands for the safe execution of the mission. The Decision Support Engine operates on the abstract objects and environment constraints contained in the Data Architecture and System Management Architecture databases. Finally, the ***Space Messaging Service*** provides a comprehensive set of inter-processor communication services for ground-to-space and space-to-space messaging.

Rather than create a completely new set of standards, SuperMOCA will build on existing standards that can be tailored or adapted to meet the specific requirements of space mission operations. The Data Architecture will draw heavily from the Information Resource Dictionary System (IRDS) and Directory Services (X.500) standards. The System Management Architecture will build on work in Transaction Processing for Space Station Freedom. The Control Interface will be built using the User Interface Language (UIL) developed by the University of Colorado for Space Station Freedom. The Decsion Support Engine will be derived from the innovative work on intelligent control of spacecraft pioneered in the Clementine mission. And, the Space Messaging Service will draw on the industrial standards Manufacturing Message Specification (MMS) and Fieldbus (SP-50).

This paper describes each of the five architectural elements of SuperMOCA. The paper also describes the integration of these five elements and associated standards into a single architecture. Since the goal of the SuperMOCA effort is an "open specification" for the commercial development of systems that "enable" space mission operations, the portals to support inter-operability of commercial products are also identified.